

Tank Employment in Expeditionary Operations

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When I went into Kuwait I had thirty-nine tanks.

After six weeks of air bombardment, I had thirty-two  
left. After 20 minutes in action against M1s  
[Abrams], I had none.

An Unknown Iraqi Battalion Commander

Operation Desert Storm

## **Introduction**

The current use of primarily light forces in Iraq and Afghanistan and the increased emphasis on expeditionary operations within the Marine Corps has inclined some to say that the tank's days as part of the Marine air ground task force(MAGTF) are numbered. The belief that light armor such as the amphibious assault vehicle (AAV), light armored vehicle (LAV), or a vehicle such as the U.S. Army's Stryker offers a similar capability to heavy armor is untrue. Although light armor is an indispensable component in combined arms operations it is incapable of providing the same capabilities as the tank and its heavy armor. The tank's unique capabilities in the areas of mobility, firepower, and survivability demonstrate it must continue to be integrated into all Marine Corps expeditionary operations.

## **Mobility**

No vehicle currently fielded by the United States Marine Corps surpasses the M1A1 tank in overland mobility. The tank is capable of climbing a higher vertical obstacle and has higher ground clearance than the AAV or LAV, and exerts less ground pressure [measured by vehicle cone index (VCI)]<sup>2</sup> than an LAV (Fig 1). Additionally, the tank's superior suspension system allows the tank to travel at higher speeds over rough terrain

that would injure the crew and occupants of either the AAV or LAV. These capabilities allow the tank to maneuver and fight in terrain that would be restrictive or impassible for the other more lightly armored vehicles of the MAGTF's ground combat element (GCE).

	Vertical Obstacle	Ground Clearance	Vehicle Cone Index
M1A1 <sup>3</sup>	49 Inches	19 Inches	25/58
AAVP7A1 <sup>4</sup>	36 Inches	16 Inches	16/37
LAV-25 <sup>5</sup>	18 Inches	14 Inches	32/72

(Fig 1)

Tanks are used in the engineering role to facilitate the mobility of other MAGTF assets while conducting offensive operations. They are used to clear obstacles such as trees and disabled vehicles out of roadways, and with the addition of a mine plow they can also be used to proof lanes through mine fields during breaching operations. Lightly armored vehicles have only a limited ability to push obstacles and no provision for the attachment of a mine plow due to a lack of power and weight (Fig 2). AAVs and LAVs would also risk damage to their hulls pushing obstacles due to their relatively thin armor.

	Horse Power	Weight in Pounds
M1A1 <sup>6</sup>	1500	135,200
AAVP7 w/EAAK <sup>7</sup>	656	62,120
LAV-25 <sup>8</sup>	275	28,200

(Fig 2)

Tanks on the other hand have the power, weight and armor protection to reduce obstacles quickly and with minimal risk to the crew.

Light armor does have niche mobility advantages over tanks. For example, the AAV is amphibious, which puts the tank at an obvious disadvantage for its movement from ship-to-shore. The tank must rely on the landing craft air cushion (LCAC) and the landing craft utility (LCU) for its transportation over water. Still, all other ground combat and support vehicles in the Marine Corps inventory share this disadvantage and have to make the ship-to-shore movement via landing craft or helicopter.<sup>9</sup> The LAV, on the other hand, is faster with a longer range while on roads. Bridges are also less of a factor with the heavier of these two vehicles weighing less than thirty-two tons fully combat loaded. These light vehicles fulfill a vital role within the MAGTF, but none of them offer the overland mobility capabilities of tanks.

### **Firepower**

The tank main gun brings more direct fire destructive force to bear with more accuracy and range than either the AAV or any variant of the LAV (Fig 3,4,5). Combined with the introduction

<b>M1A1 Armament<sup>10</sup></b>	Range	Stabilized	Thermal
120mm	4000M	Yes	Yes
50 Cal	1830M	No	Yes

7.62mm COAX	900M	Yes	Yes
7.62mm	900M	No	No

(Fig 3)

<b>LAV-25/LAV-AT<sup>11</sup></b>	Range	Stabilized	Thermal
TOW 2A/TOW 2B	3750	No	Yes
25MM	2200	Yes	Yes
7.62 COAX	900	Yes	Yes
7.62 Pintle	900	No	No

(Fig 4)

<b>AAVP7<sup>12</sup></b>	Range	Stabilized	Thermal
Mk-19	2200	No	No
50 Cal	1830	No	No

(Fig 5)

of modern fire control and sighting systems the gun has allowed tanks to surpass missile firing light armor in anti-tank (AT) capability and flexibility engaging a variety of point targets.

In fact, the tank main gun is the most effective precision weapons system in the GCE whether being used in the AT role or as a bunker buster in support of infantry. It can be fired on the move and in all weather conditions out to ranges beyond the capability of the TOW. In contrast, the LAV-25 gun is incapable of defeating tanks and the LAV-AT fires the TOW missile which limits it to stationary firing only. The AAV has no missile system other than those carried by infantrymen inside the vehicle. For both the LAV and AAV AT capability is provided solely by missiles.

Ammunition characteristics also play a large role in the superior AT capability of the tank. Tanks use kinetic energy (KE) warheads as the primary means to defeat enemy armor.<sup>13</sup>

Missiles, on the other hand, use the chemical energy of their explosive warheads to pierce armor due to their inability to generate the necessary velocity for an effective KE warhead. The effectiveness of explosive warheads can be degraded through the use of simple and proven armor upgrades. These armor upgrades include but are not limited to slat armor (fig 6), box armor (fig 7), or reactive armor (fig 8). These armor upgrades,



14

Russian BTR-80 w/Slat armor (Fig 6)



15

Iraqi T-55 w/Box armor (Fig 7)



16

Russian T-72 w/Reactive armor (Fig 8)

however, have very little effect on KE ammunition which can only be fired by tanks.

In an attempt to make up for the AT capability shortfalls of missiles new technologies are constantly being developed. New missile guidance systems allow the ATGM user to "fire and



forget" as in the case of the Javelin. This system protects the shooter by eliminating the need for him to remain exposed while guiding the missile to target. Also, new variations of missiles such as the Javelin and tube-launched, optically-tracked, wire-guided (TOW)2B have the capability to attack armor from the top defeating targets where the armor is thin. Missiles, though, still fall short of a tank's main gun in performance against a well trained adversary. They have a relatively slow speed in relation to gun employed munitions allowing the target being engaged time to react and possibly protect itself by maneuvering or returning fire. The TOW, for example, has a 21 second time-of-flight to 3750 meters.<sup>17</sup> The M829 120mm Sabot projectile reaches 3750 meters in less than 2.5 seconds.<sup>18</sup> Missiles are also very expensive to produce when compared to gun ammunition and are therefore rarely produced in anything other than high explosive anti-tank (HEAT) configurations which makes them less effective on vehicles equipped with slat armor, box armor, or reactive armor. These armor technologies are currently in use by many countries as can be seen in figures 6,7, and 8 and have been proven effective in combat. While technology continues to make missile technology more lethal the tank main gun will continue to be the more lethal of the two.

A tank's firepower is also enhanced by the large variety of ammunition that it can fire. These ammunition types enable tanks

to engage a large variety of targets successfully including personnel, bunkers, armored personnel carriers (APCs), tanks, and attack helicopters. This combined with the large overall quantity of ammunition carried by the tank in 120mm, 50cal, and 7.62 enables the tank to stay in the fight longer even when heavily engaged. Furthermore, the lower cost of the 120mm ammunition when compared with missiles, enables crews to become more proficient with their weapons systems during peacetime further enhancing the overall performance of the tank. The AAV using the 50 cal/40mm upgunned weapons station and the LAV using the 25mm gun in concert with its two 240s provide only a fraction of the tanks capability and flexibility.

### **Survivability**

The survivability that a tank brings to the battlefield allows a commander more flexibility in employing his force. Because a tank is more likely to survive the fires of enemy weapons systems, they can be employed in environments that would destroy lightly armored vehicles. Tanks can lead a mounted assault quickly and the commander can be confident that if the enemy does get the first round off, it will not lead to a catastrophic loss. Tanks can also survive the repeated rocket propelled grenade (RPG) attacks likely to be suffered while providing close support to the infantry in a city or built up

area, while an AAV or LAV would not. This capability to survive enemy attack facilitates tempo and affects the enemy's morale if he believes he is in an unwinnable situation.

In an effort to enhance the survivability of light armor upgrades have been made to the AAV in the form of the enhanced appliqué armor kit (EAAK), a bolt on armor upgrade. Currently no upgrades are installed on the LAV. EAAK is effective at increasing the AAVs resistance to MG and artillery fire but only marginally effective against HEAT weapons such as a RPG. The previously mentioned slat armor, box armor, or reactive armor is effective at minimizing the effect if HEAT weapons but is not currently used by the Marine Corps for a variety of reasons. Slat armor increases the size of a vehicle greatly because of the standoff required to work. Reactive armor can be a danger to troops nearby because the armor explodes to counteract the effects of HEAT ammunition. Box armor, like EAAK, add considerable weight to the vehicles. But, none this armor is as effective as that of a tank.

The M1A1 tank's frontal armor has never been fully penetrated by any weapon system and the tank has proven survivable on the battlefield during both Desert Storm and current combat operations in Iraq. Tanks have been destroyed by the enemy but this has required him to allocate significant resources and attack known weak areas of the tank. Upgrades to

the M1A1 tanks armor including reactive armor have been developed. Some of these upgrades are being incorporated into the tank while others such as reactive armor are currently not being fielded due to the danger they would pose to the dismounted infantry. Furthermore, the tank incorporates a nuclear, biological, and chemical (NBC) over pressurization system, Halon fire extinguishing system, and separated ammunition compartments to protect the crew. All of these features facilitate the aggressive employment of the tank on the mechanized battlefield.

### **Conclusion**

The M1A1 tank currently employed by the Marine Corps brings capabilities to the MAGTF that no other vehicle can provide. The tank's characteristics of mobility, firepower, and survivability give it the ability to provide close support to infantry operations over a wider spectrum of conflict than more lightly armored vehicles. Although heavier than the AAV and LAV the tank should continue to be integrated into all MAGTFs from the MEU to the MEF. The tank in conjunction with the other weapons systems of the MAGTF forms a team that should always be employed together.

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## Notes

1. Tom Clancy, *Armored Cav* (New York: Berkley Books, 1994), 62.
2. United States Army. *Planning And Design Of Roads, Airfields, And Heliports In The Theater Of Operations - Road Design, FM 5-430-00-1*. (Washington, D.C.: HQ Department of the Army, 1994), Appendix D
3. United States Marine Corps. *Marine Corps Tank Employment, MCWP 3-12*. (Quantico, VA: Marine Corps Combat Development Command, 2005), Appendix A
4. United States Marine Corps. *Employment of Amphibious Assault Vehicles (AAVs), MCWP 3-13 w/chg 1*. (Quantico, VA: Marine Corps Combat Development Command, 2003), Appendix B
5. "Light Armored Vehicle-25," *FAS Military Analysis Network*. <<http://www.fas.org/man/dod-101/sys/land/lav-25.htm>> (17 December 2007)
6. United States Marine Corps. *Marine Corps Tank Employment, MCWP 3-12*. (Quantico, VA: Marine Corps Combat Development Command, 2005), Appendix A
7. United States Marine Corps. *Employment of Amphibious Assault Vehicles (AAVs), MCWP 3-13 w/chg 1*. (Quantico, VA: Marine Corps Combat Development Command, 2003), Appendix B
8. "Light Armored Vehicle-25, United States Marine Corps Fact File," *About.com:US Military*. <http://usmilitary.about.com/library/milinfo/marinefacts/bllav25.htm> (7 January 2008)
9. United States Marine Corps. *Amphibious Ships And Landing Craft Data Book, MCRP 3-31B*. (Quantico, VA: Marine Corps Combat Development Command, 2001), 24,25
10. United States Marine Corps. *Marine Corps Tank Employment, MCWP 3-12*. (Quantico, VA: Marine Corps Combat Development Command, 2005), Appendix A
11. United States Marine Corps. *Light Armored Vehicle-25 Gunnery and Employment, MCWP 3-14.1*. (Quantico, VA: Marine Corps Combat Development Command, 2005), 1-6

12. United States Marine Corps. *Employment of Amphibious Assault Vehicles (AAVs), MCWP 3-13 w/chg 1.* (Quantico, VA: Marine Corps Combat Development Command, 2003), Appendix B

13. United States Army. *Tank Gunnery (Abrams), FM 3-20.12.* (Washington, D.C.: HQ Department of the Army, 2001), Chapter 4

14. "Russian BTR-80 Equipped with slat-armor," *Strategy Page*. <[http://www.strategypage.com/military\\_photos/20061260.aspx](http://www.strategypage.com/military_photos/20061260.aspx)> (17 December 2007)

15. "Iraqi T-55 with box armor," *FAS Military Analysis Network*. <<http://www.fas.org/man/dod-101/sys/land/row/t54tank.htm>> (17 December 2007)

16. "Russian BTR-80 Equipped with slat-armor," *Strategy Page*. <[http://www.strategypage.com/military\\_photos/20061260.aspx](http://www.strategypage.com/military_photos/20061260.aspx)> (17 December 2007)

17. "M220 TOW," *FAS Military Analysis Network*. <<http://www.fas.org/man/dod-101/sys/land/tow.htm>> (17 December 2007)

18. United States Army. *Firing Tables, Cannon, 120MM Gun, M256.* (Washington, D.C.: HQ Department of the Army, 1994), 4

## Bibliography

- Baker, Roger G. *USMC Tanker's Korea*. Oakland, OR: Elderberry Press, 2001.
- Clancy, Tom. *Armored Cav*. New York, Berkley Books, 1994.
- Gilbert, Oscar E. *Marine Corps Tank Battles In Korea*. Havertown, PA: Casemate, 2003.
- Gilbert, Oscar E. *Marine Tank Battles in the Pacific*. Conshohocken, PA: Combined Publishing, 2001.
- Guderian, Heinz. *Achtung - Panzer!* Translated by Christopher Duffy. London: Brockhampton Press, 1999
- Guderian, Heinz. *Panzer Leader*. Translated by Constantine Fitzgibbon. Cambridge, MA: Da Capo Press, 2002
- "Iraqi T-55 with box armor," *FAS Military Analysis Network*.  
<<http://www.fas.org/man/dod-101/sys/land/row/t54tank.htm>>  
(17 December 2007)
- "Light Armored Vehicle-25," *FAS Military Analysis Network*.  
<<http://www.fas.org/man/dod-101/sys/land/lav-25.htm>> (17 December 2007)
- "Light Armored Vehicle-25, United States Marine Corps Fact File," *About.com:US Military*. <http://usmilitary.about.com/library/milinfo/marinefacts/bllav25.htm> (7 January 2008)
- "M220 TOW," *FAS Military Analysis Network*.  
<<http://www.fas.org/man/dod-101/sys/land/tow.htm>> (17 December 2007)
- "Russian BTR-80 Equipped with slat-armor," *Strategy Page*.  
<[http://www.strategypage.com/military\\_photos/20061260.aspx](http://www.strategypage.com/military_photos/20061260.aspx)>  
(17 December 2007)
- "Russian T-72 with reactive armor," *FAS Military Analysis Network*. <<http://www.fas.org/man/dod-101/sys/land/row/t72tank.htm>> (17 December 2007)
- United States Army. *Firing Tables, Cannon, 120MM Gun, M256*. Washington, D.C.: HQ Department of the Army, 1994
- United States Army. *Planning And Design Of Roads, Airfields,*

*And Heliports In The Theater Of Operations - Road Design, FM 5-430-00-1.* Washington, D.C.: HQ Department of the Army, 1994

United States Army. *Tank Gunnery (Abrams), FM 3-20.12.* Washington, D.C.: HQ Department of the Army, 2001

United States Marine Corps. *Amphibious Ships And Landing Craft Data Book, MCRP 3-31B.* Quantico, VA: Marine Corps Combat Development Command, 2001

United States Marine Corps. *Armor/Antiarmor Operations In Southwest Asia.* Quantico, VA: Marine Corps Combat Development Command, 1991

United States Marine Corps. *Employment of Amphibious Assault Vehicles (AAVs), MCWP 3-13 w/chg 1.* Quantico, VA: Marine Corps Combat Development Command, 2003

United States Marine Corps. *Light Armored Vehicle-25 Gunnery and Employment, MCWP 3-14.1.* Quantico, VA: Marine Corps Combat Development Command, 2005

United States Marine Corps. *Marine Amphibious Brigade Mechanized And Countermechanized Operations.* Quantico, VA: Marine Corps Development And Education Command, 1981

United States Marine Corps. *Marine Corps Tank Employment, MCWP 3-12.* Quantico, VA: Marine Corps Combat Development Command, 2005

United States Marine Corps. *Sand and Steel, Lessons Learned On U.S. Marine Corps Armor And Anti-Armor Operations From The Gulf War.* Quantico, VA: Marine Corps Combat Development Command, 1993

United States Marine Corps. *Tanks, Draft Revision LFM-14.* Washington, D.C.: HQ U.S. Marine Corps, 1959